

OIB**Antarctic Flight 9, Pine Island Glacier #1**

Aircraft	DC-8
Flight Number	DC8-100117
Flt Req #	108002
Flight Hours	11.7
Date	10/29/09
Purpose of Flight	ICE Bridge-Pine Island Glacier – 1
Aircraft Status	Airworthy
Sensor Status	All installed sensors operational.
Significant Issues	None
Accomplishments	Low level survey over Pine Island Glacier. Weather conditions were excellent. ATM & MCoRDS reported normal operation throughout the flight (Gravimeter operated but not monitored during this flight). DMS collected 11,000 images, MCoRDS reported detecting bedrock under the glacier about 60% of the time, ATM very happy with the flight's execution and with the flight crew using SOXMAP to guide the aircraft for the first time on this deployment, Snow Radar collected 275 gigabits of data and Ku-Band Radar 400 gigabits of data, and LVIS collected data during ocean transits and while over sea ice areas and calibration maneuver data. DACOM/DLH, AVOCET, and WAS did not participate in this flight.
Planned events	Planning for Sea Ice-3 tomorrow

Flight Summary

Pine Island Glacier-1, FLT 9

Thursday, October 29, 2009

Seelye Martin (Mission Principal Investigator):

Weather summary: This was a hard call. Last night, we had three potential missions: Sea Ice-3, Peninsula-4 and PIG-1. By morning, the Sea Ice and Peninsula missions were out of the running because of bad weather. Pine Island was iffy because of a large low approaching from the west. However, the timing of the leading edge of the low was such that it reached the area at about 1800 UTC, which one hour before we were due to leave the area. When we talked with Chilean flight services, based on satellite and local winds and cloud elevation data, they felt that the ceiling would remain sufficiently high until we left the area. We decided on this basis to fly the mission.

Mission Description:

The mission is a repeat of lines flown in 2002 by the joint Chilean/NASA mission on the Chilean P-3. It also completes the survey of the PIG Ice Tongue designed to supplement the underwater observations made by the British with Autosub. This will also be the first mission flown with the ATM navigation system, called SOXMAP, where the pilots are provided with a display that allows them to accurately track the earlier P-3 tracks, and SOXCDI, which actually flies the aircraft along a given line. Given the importance of flying an exact repeat to the 2002 tracks, so that we can calculate the changes in ice thickness between the flights, and that this is the first time that the pilots will use the system under ice conditions, the use of this system is also a source of concern.

Time line of flight:

0855 local: Plane took off, transited to 33,000 ft, headed for Pine Island.

1100: sea ice observed at surface, LVIS taking data.

1147: 10 minutes out from our first waypoint.

1150: can see coast with open water ahead, looks like we are coming up on our landfall, looks cloudy.

1153: descending through 24,000 ft, it's hard to tell what's at the surface. Looks like a major stratus deck below.

1156: passing through 20,000 ft, descent rate is 2,000 ft/min. Aircraft is cold, outside temp is -43 C.

1202: 7,000 ft, looks like we are entering the deck, some turbulence within cloud layer, 1204: 6,500 still in clouds.

1205: crew has ground contact, so they are descending. 5 min out to first waypoint. Can see surface, appearance is changed by presence of cloud shadows. We have a clear surface at 1,500 ft. Amazing!

1210: turning into line, now we need to see if the pilots can work with the navigation system. Nav system has two forms: SOXMAP, which displays the aircraft position relative to the desired track, and SOXCDI, which actually controls the aircraft heading.

1231: SOXMAP display shows that pilots are doing a good of tracking, weather appears to be holding.

1236: still good ground visibility, pilots following SOXMAP. Going down the PIG, weather remains good, some high clouds to west, probably associated with the

low moving in.

1352: turning over Pine Island Bay, going out, beautiful sequence of open water, transition to grease ice, then to pancake. Air temp -15 C, wind speed, 15 kts from 120 deg.

1400: halfway there, looks like we have beaten the weather.

1508: This mission is the amalgamation of two P-3 missions since we have the greater endurance.

1554: running gravity line across ice tongue, we are letting SOXCDI fly the airplane. High clouds from the low are moving in; we will probably beat the weather.

1600: ice edge in view.

1601: over open water, wind speed is 12 knots, high and mid-level clouds are moving in from the low to the west. We are maneuvering to run the gravity track up the ice shelf.

1643: Because plane is flying slower than usual (about 200 kts), we are staying on station longer than in previous missions. Slower speed is necessary to fly the 2002 flight lines.

1655: clouds slowly moving in; we have ordered the AMPS weather products from the ground crew in Punta Arenas for planning tomorrow's mission, but they are coming in very slowly.

1707: finished lines, climbing to cruise altitude.

1748: Ground crew reports that there is a major blizzard + power failures in Boulder, which may account for the slow arrival of the AMPS products, but they eventually did arrive.

2000: near Punta Arenas, doing high level and low laser and camera calibrations over the runway.

2029: landed, flight duration: 11 hr 34 minutes.

Individual instrument reports:

ATM: Today's flight-lines followed two previous Pine Island missions flown by the ATM and KU radars in 2002 and 2004, using the SOXMAP system on the DC8 for the first time during an operational mission. The SOXMAP system uses a cockpit map display and is used to navigate complex flight paths, particularly meandering flights down glaciers that cannot be followed by an autopilot.

SOXMAP navigation relies on the pilots watching the display and manually navigating the aircraft over previous ATM laser data swaths that are only ~900' wide. In doing so, radar and laser data taken this year can be compared to data taken in previous years (2002 and 2004). SOXMAP navigation places a premium on pilot concentration and navigation skill. The SOXDCI instrument was also tested and used to fly the plane during the second half of the flight. In both cases, the DC8 crew did an excellent job in positioning the aircraft over the previous tracks. The ATM, GPS, NAV and ATM camera (Cambot) systems all performed well. No instrument problems, clear weather, collected data throughout. The ATMS collected about 150 million data points, with no data lost to clouds. The combined two ATM systems have now collected over 1 billion laser elevation measurements during the seven low altitude missions flown during this deployment.

LVIS: The LVIS instrument was operated at high altitude on the transits to and from the Pine Island Region. The transit sections were quite cloudy but approximately an hour of sea ice data was collected. LVIS was also operated at low altitude for much of the sampling in the Pine Island Glacier region. The telescope aperture of LVIS was reduced to approximately 1 inch in diameter to reduce the return signal strength to a level that is compatible with the LVIS detector system. LVIS was originally designed to operate at high altitudes, consequently at low altitude LVIS has a very narrow swath and somewhat sparse coverage but the altimetry data is of high quality and will be useful for comparisons with the high-altitude LVIS passes. The instrument worked very well during this flight. No problems were encountered. The LVIS digital camera system was also operated for this mission and collected numerous high resolution images of the many unique ice structures and patterns along the flight lines, and, most notably, off the tongue of Pine Island Glacier.

DMS: The DMS obtained imagery with 10 cm resolution and approximately 70% forward overlap over the entire ATM flight tracks. Approximately 11,000 images were recorded. The flight area was generally of low relief and roughness that can be enhanced somewhat by contrast enhancement of the images, as shown below. The images are cropped areas of larger frames and are approximately 100 meters by 100 meters.

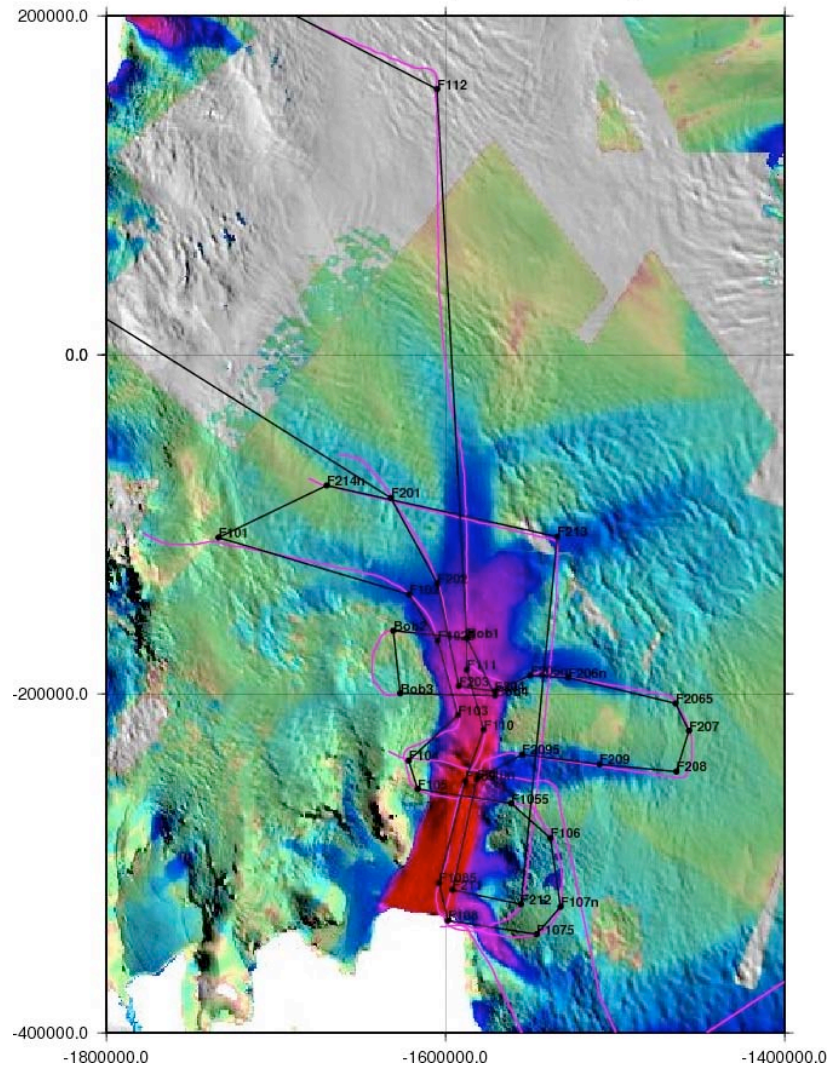
Jim Yungel (ATM Team):

A successful mission (#9) to Pine Island glacier (PIG1) was flown today in clear sunny conditions. Late in the mission we could see the high overcast that is preceding a low pressure system forecast to enter the Pine Island area. Today's flight-lines followed two previous Pine Island missions flown by the ATM and KU radars in 2002 and 2004, using the Soxmap system on the DC8 for the first time during an operational mission. The Soxmap system uses a cockpit map display and is used to navigate complex flight paths, particularly meandering flights down glaciers that cannot be followed by an autopilot. Soxmap navigation

relies on the pilots watching the display and manually navigating the aircraft over previous ATM laser data swaths that are only ~900' wide. In doing so, radar and laser data taken this year can be compared to data taken in previous years (2002 and 2004). Soxmap navigation places a premium on pilot concentration and navigation skill. The DC8 crew did a excellent job in positioning the aircraft over the previous tracks. The ATM, GPS, NAV and Cambot systems all performed well again, and the KU radar reported obtaining good data. A ramp pass at 2000' was flown over the Punta Arenas airport ramp before landing. The combined two ATM systems have now collected over 1 billion laser elevation measurements during the 7 low altitude missions flown during this deployment. The weather forecast for several sites is promising for a mission tomorrow.

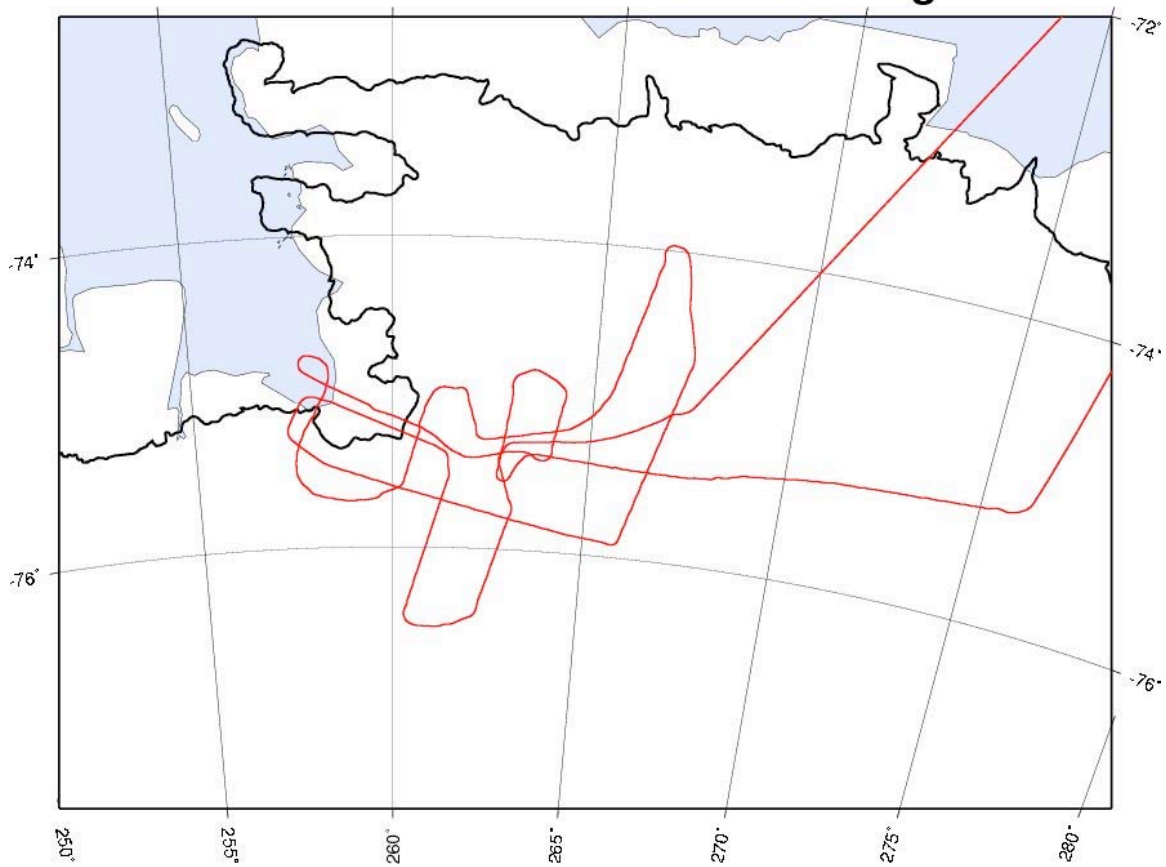
Pine Island 1

10.9 hrs total / 4.5 hrs survey
440 knots transit / 250 knots survey



First view of the flight lines superimposed on Interferometric SAR velocity map, where red is fast, blue is slow. Pine Island Glacier is about 40-km wide at the grounding line.

091029 Pine Island Glacier 1 Flight



Another view, rotated by 90 deg; heavy line shows the grounding line, light line shows the glacial ice edge.